Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.
• This manual describes the specifications, precautions for operation and required items for maintenance or inspections, for proper application of the MOTOMAN-EPX1250. Read this manual carefully and be sure to understand its contents before handling the Motoman.

• General items related to safety are listed in Section 1: Safety of the Setup Manual. To ensure correct and safe operation, carefully read the Setup Manual before reading this manual.

• Refer to NX100 Operator’s Manual for the operation methods.

• Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.

• The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

• Yaskawa may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

• If your copy of the manual is damaged or lost, contact a Yaskawa representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

• Yaskawa is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product’s warranty.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association  
900 Victors Way  
P.O. Box 3724  
Ann Arbor, Michigan 48106  
TEL: (734) 994-6088  
FAX: (734) 994-3338  
www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved Yaskawa training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
NOTES FOR SAFE OPERATION

Read this manual carefully before installation, operation, maintenance, or inspection of the Motoman. In this manual, the Notes for Safe Operation are classified as “DANGER”, “WARNING”, “CAUTION”, “MANDATORY”, or “PROHIBITED”.

- **DANGER**: Indicates an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.
- **WARNING**: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.
- **CAUTION**: Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.
- **MANDATORY**: Always be sure to follow explicitly the items listed under this heading.
- **PROHIBITED**: Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.

**NOTE**: To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “DANGER”, “WARNING” and “CAUTION”.

**DANGER**

- Maintenance and inspection must be performed by specified personnel. Failure to observe this caution may result in electric shock or injury.
- For disassembly or repair, contact your Yaskawa representative.
- Do not remove the motor, and do not release the brake. Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator’s arm.
Before operating the manipulator, check that servo power is turned off when the emergency stop buttons on the front door of the NX100 and programming pendant are pressed. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn ON the servo power.

Injury may result from unintentional or unexpected manipulator motion.

Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
- Be sure to use a lockout device to the safeguarding when going inside.
- Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
- View the manipulator from the front whenever possible.
- Always follow the predetermined operating procedure.
- Keep in mind the emergency response measures against the manipulator’s unexpected motion toward you.
- Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
- Turning ON the NX100 power.
- Moving the manipulator with the programming pendant.
- Running check operations.
- Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem. The emergency stop button is located on the right of front door of the NX100 and the programming pendant.
The Motoman is the Yaskawa industrial robot product. The Motoman usually consists of the manipulator, the controller, the programming pendant, and manipulator cables.

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX100 controller</td>
<td>NX100</td>
</tr>
<tr>
<td>NX100 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>
Explanation of Warning Labels

The following warning labels are attached to the manipulator. Always follow the warnings on the labels. Also, an identification label with important information is placed on the body of the manipulator. Prior to operating the manipulator, confirm the contents.
Safeguarding Tips

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator’s manuals, the system equipment, and options and accessories should be permitted to operate this equipment.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
- The system must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

Mechanical Safety Devices

The safe operation of this equipment is ultimately the users responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this equipment.

Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety equipment is provided as standard:

- Safety barriers
- Door interlocks
- Emergency stop palm buttons located on operator station

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
Programming, Operation, and Maintenance Safety

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this equipment should be permitted to program, or maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the equipment to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Check the E-Stop button on the operator station for proper operation before programming. The equipment must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.
- Any modifications to the controller unit can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the controller unit. Making any changes without the written permission from Yaskawa will void the warranty.
- Some operations require a standard passwords and some require special passwords.
- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications. All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that the changes have not created hazards or dangerous situations.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Use proper replacement parts.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

Maintenance Safety

Turn the power OFF and disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

Perform only the maintenance described in this manual. Maintenance other than specified in this manual should be performed only by Yaskawa-trained, qualified personnel.
Summary of Warning Information

This manual is provided to help users establish safe conditions for operating the equipment. Specific considerations and precautions are also described in the manual, but appear in the form of Dangers, Warnings, Cautions, and Notes.

It is important that users operate the equipment in accordance with this instruction manual and any additional information which may be provided by Yaskawa. Address any questions regarding the safe and proper operation of the equipment to Yaskawa Customer Support.

Customer Support Information

If you need assistance with any aspect of your EPX1250 system, please contact Yaskawa Customer Support at the following 24-hour telephone number:

(937) 847-3200

For routine technical inquiries, you can also contact Yaskawa Customer Support at the following e-mail address:

techsupport@motoman.com

When using e-mail to contact Yaskawa Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Yaskawa Customer Support at the telephone number shown above.

Please have the following information ready before you call Customer Support:

- System: EPX1250
- Primary Application: ___________________________
- Controller: NX100
- Software Version: Access this information on the Programming Pendant’s LCD display screen by selecting (MAIN MENU) - (SYSTEM INFO) - [VERSION]
- Robot Serial Number: Located on the robot data plate
- Robot Sales Order Number: Located on the NX100 controller data plate
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10 Recommended Spare Parts
1 Safety Precautions

1. Respect the law, local regulations, and safety codes for connecting the painting robot.

2. Specify the working regulations and the person in charge for the following operations:

   • Turning the power to the robot ON/OFF, and RUN/STOP operations
     To avoid any faulty operation, take measures such as putting up a notice to remind
     operators of procedures and precautions explained in the instruction manual.

   • Warning sign or signal to inform operator of the robot operation status
     Starting an operation while someone is in the manipulator's working envelope or while
     someone is doing maintenance checks or repairs may cause a serious accident.
     When on standby, the manipulator can be moved by an external signal.
     To avoid these accidents caused by a lack of information, put up a board or indicator
     lamp to show the robot operation status.

   • Action to be taken in case of a failure or an accident
     Appoint a person to be contacted and the action to be taken in case of a failure or an
     accident.

   • Safety standards and the supervisor for safe operation
     Appoint a supervisor for the safe operation of the manipulator and establish the work-
     ing regulations.

   • Appoint a person to be in charge of teaching, maintenance and inspections and pro-
     vide training or lectures on safety and the actions to be taken in case of an emergency.

WARNING

Install the MOTOMAN-EPX1250 in a location that meets the requirements of Area
Classification 'Division I' prescribed in FM Approval Standard.
1 Safety Precautions

---

**WARNING**

- Take the following measures when teaching, correcting, inspecting, or adjusting the manipulator when the motor power supply is ON:
  
  (a) Appoint a personnel to stay beside the emergency stop button of the NX100. And perform the operations holding the programming pendant with the emergency stop button.
  
  (b) Before the operation, verify the correct robot motion and that the emergency stop works.

- Observe the following precautions during an automatic operation:
  
  (a) Do not enter inside the safeguards during operation.
  
  (b) Confirm the following before starting the operation:
      - No person is inside the manipulator working envelope
      - No obstacles such as unnecessary workpieces and tools are inside the manipulator working envelope
      - The manipulator is in its standby position
  
  (c) When any abnormality occurs, immediately press the emergency stop button to stop the manipulator.
  
  (d) Before entering inside the manipulator working envelope, be sure to stop the manipulator and turn OFF the main power supply to the NX100.

- **Brake release (Option)**

  A braking system is provided on each axis of the manipulator to hold the arm in its position when a failure or fault occurs. When the brake is activated, the manipulator cannot be moved manually even if the power is OFF. To change the posture of the manipulator after a failure or fault, the brake can be released by the operation from the controller.

  When the brake is released with the manipulator’s power OFF, each axis falls down because of the arm weight. While two or more people are holding the arm in position before releasing the brake, change the posture of the manipulator within the minimum motion range.

  Use the brake release function only when absolutely necessary.

---

**PROHIBITED**

Any modification of the MOTOMAN-EPX1250, and the following is strictly prohibited:

1. Explosion-proof devices and system installation
2. Safeguards and the safety devices mounted on these safeguards
3. Emergency stop button, and other safety devices
4. Robot control system such as the NX100 robot controller, the manipulator drive section and the power transmission section
2 Features

The MOTOMAN-EPX1250 is designed for easy-handling and to consider safety first in operation.

2.1 Methods of Protection

The MOTOMAN-EPX1250 is evaluated as Type X Purged for use in Class I, Division 1, Groups A, B, C and D indoor hazardous (classified) locations T4, and appear in the Factory Mutual (FM) Research Approval Guide. They have the construction of protection as follows:

Method of Protection:

- **The pressurized explosion-proof method** prevents explosive gas from entering the manipulator by supplying a protective gas, such as clean air or an inert gas, to keep the internal air pressure constant.
- **The Intrinsic-safety explosion-proof method** prevents explosive gas from igniting by electric spark and heat.

![WARNING]

Install the MOTOMAN-EPX1250 in a location that meets the requirements of Area Classification "Division1" prescribed in FM Approval Standard.
2.2 Teaching

The target positions, the motion speed, and the ON/OFF timing of the spray can be taught with the programming pendant while moving the manipulator, which shortens the time required for teaching. And, the data can be corrected at any time. Because the teaching function and the correction function are integrated, the operations such as forward/reverse run, position modification, addition/deletion of points can be performed during teaching. And the management function, which manages the parameter settings, enables you to monitor the actual status during teaching. The on-screen guidance and the interactive system on the pull-down menus lead the operator through the operation procedures.

(1) Large-capacity backup as standard
   The large-capacity drive for PC cards is provided as a standard feature of backup unit and enables data to be transmitted easily.

Be sure to save the backup data for the controller, such as the data for jobs and constants, on a PC card. If not, the necessary data for the manipulator may be lost if an internal memory fault occurs in the controller.

(2) High reliability
   a) The built-in microcomputer continuously checks the I/O data and the manipulator motion to ensure high-reliability.
   b) Can detect power supply faults and software faults with its self-diagnosis functions.

(3) When an error such as an operation error or a controller fault occurs, the alarm code and message are displayed, and the date and time of the error occurrence with its explanation are stored in the alarm history to help you take a quick, corrective action.
3 Installation

3.1 Requirements

Prepare the power supply, the air supply, and the grounding according to the following specifications.

Table 1 Specifications

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Specifications</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply</td>
<td>3-phase 200/220 VAC (-15% - +10%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50/60 Hz (±2 Hz)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5 kVA (at peak)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Air supply Pressurized explosion-proof enclosure</td>
<td>Required pressure: 0.35 MPa to 0.65 MPa</td>
<td>Use dry air for the pressurized explosion-proof construction.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capacity:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>For pressurized type of explosion-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>protected construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 Nl/min usually</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>300 Nl/min usually</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dryness: Freezing at -18 °C</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Grounding</td>
<td>Grounding resistance: 100 ohm or less (Non I.S. GND)</td>
<td>For the robot controller</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 ohm or less (I.S. GND)</td>
<td></td>
</tr>
</tbody>
</table>

CAUTION

Use dry air for the pressurized explosion-proof enclosure. Moisture in the air supply may damage the electronic parts.
3 Installation

3.2 Installation Site

This section describes the conditions of the installation site for the robot system. Only devices that are approved as explosion-proof can be installed in hazardous locations. Refer to the local regulations and safety codes for the definition of a hazardous location. Install the controller and control panels in a location free from water drops, dust, and dirt.

### Table 2: Installation Site

<table>
<thead>
<tr>
<th>System Components</th>
<th>Hazardous Location (Inside Painting Booth)</th>
<th>Non-hazardous Location (Outside Painting Booth)</th>
<th>Ambient Temperature</th>
<th>Maximum Ambient Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulator (explosion-proof)</td>
<td>○</td>
<td>-</td>
<td>0 - 40 °C</td>
<td>less than 80% RH</td>
</tr>
<tr>
<td>Controller (not explosion-proof)</td>
<td>×</td>
<td>○</td>
<td>0 - 45 °C</td>
<td>less than 90% RH</td>
</tr>
<tr>
<td>Pneumatic unit (not explosion-proof)</td>
<td>×</td>
<td>○</td>
<td>0 - 45 °C</td>
<td>less than 85% RH</td>
</tr>
<tr>
<td>Programming pendant (not explosion-proof)</td>
<td>×</td>
<td>○</td>
<td>0 - 40 °C</td>
<td>less than 85% RH</td>
</tr>
<tr>
<td>Programming pendant (explosion-proof) (Option)</td>
<td>○</td>
<td>○</td>
<td>0 - 40 °C</td>
<td>less than 85% RH</td>
</tr>
<tr>
<td>Conveyer speed detector (not explosion-proof)</td>
<td>×</td>
<td>○</td>
<td>0 - 50 °C</td>
<td>less than 90% RH</td>
</tr>
<tr>
<td>Conveyer speed detector (explosion-proof)</td>
<td>○</td>
<td>-</td>
<td>0 - 50 °C</td>
<td>less than 90% RH</td>
</tr>
<tr>
<td>Conveyer switch (explosion-proof)</td>
<td>○</td>
<td>-</td>
<td>0 - 50 °C</td>
<td>less than 90% RH</td>
</tr>
<tr>
<td>Workpiece supplier (explosion-proof)</td>
<td>○</td>
<td>○</td>
<td>0 - 50 °C</td>
<td>less than 85% RH</td>
</tr>
<tr>
<td>Control panel for workpiece supplier (not explosion-proof)</td>
<td>×</td>
<td>○</td>
<td>0 - 45 °C</td>
<td>less than 90% RH</td>
</tr>
</tbody>
</table>

Safety devices
- Box for emergency stop switches
- Safety plugs
- Limit switches
- Flashing light
- Indicator lamps
- Photoelectric switches

Selected according to the requirements of the customer. Refer to the appropriate instruction manual provided separately.

× : Not acceptable
○ : Acceptable
- : No description

---

**WARNING**

Devices that are not explosion-proof must not be installed in hazardous locations. Failure to observe this warning may result in a fire.
4 Transport and Installation

Carry out the operation safely observing the following precautions.

1) Signs indicating prohibitions such as, “The lighting of fires is prohibited”
2) Clean working place that is clearly defined and free of obstacles
3) Appointment of personnel in charge
4) Company working regulations for safe operation

4.1 Preparation

Before installing the Motoman, do the following:

1) Confirm the installation layout and the dimensions of each device to ensure the transportation route and the installation space.
2) Check if the transportation route can support the weight of each device. If necessary, reinforce the route.
3) To lift the manipulator, use the appropriate machinery such as a forklift.
4.2 Receiving

When the package arrives, check the contents. Are the items and quantities in accordance with your order sheet? Was any damage incurred during shipment?

**CAUTION**

- Confirm that the manipulator and the NX100 have the same order number. Special care must be taken when more than one manipulator is to be installed.

If the numbers do not match, manipulators may not perform as expected and cause injury or damage.

---

**Fig. 1 Location of Order Number Label**

- THE MANIPULATOR AND THE CONTROLLER SHOULD HAVE SAME ORDER NUMBER.
- ORDER No.

Check that the manipulator and the NX100 have the same order number.

(a) NX100 (Front View)  (b) Manipulator (Side View)

---

HW1481006
4.3 Transport

**CAUTION**

- Sling and crane or forklift operations must be performed by authorized personnel only.
  Failure to observe this caution may result in injury or damage.
- Avoid excessive vibration or shock during transport.
  The system consists of precision components. Failure to observe this caution may adversely affect performance.

4.3.1 Transporting Method

**NOTE**

- Check that the eyebolts are securely fastened.
- The mass of the manipulator is approximately 115 kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the mass.
- The attached eyebolts are designed to support the manipulator mass. Never use them for anything other than transporting the manipulator.
- Mount the shipping bolts and brackets before transporting the manipulator.
- With any transportation equipment, make sure to avoid external force on the arm or motor unit when transporting the manipulator.
## Using a Crane

As a rule, when uncrating the manipulator and moving it, a crane should be used. Lift the manipulator with a wire rope using the attached eyebolts. Make sure to fix the manipulator with shipping bolts and brackets before transport, and lift it in the posture as shown in Fig. 2 "Transport Using a Crane".

![Figure 2: Transport Using a Crane](image-url)
Using a Forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts and bracket as shown in Fig. 3 "Transport Using a Forklift". Insert forks under the pallet and lift it. The pallet must be strong enough to support the manipulator. Transport the manipulator slowly with due caution in order to avoid overturn or slippage.

4.3.2 Shipping Bolts and Brackets

The manipulator is provided with shipping bolts and brackets at positions as shown in the figures in Fig. 2 "Transport Using a Crane", to protect its driving units from various external force during transport. They are painted yellow.

Before turning ON the power, check to be sure that the shipping bolts and brackets are removed. The shipping bolts and brackets then must be stored for future use, in the event that the manipulator must be moved again for relocation.
4.4 Installation

**WARNING**

- Install the safeguarding.
  
  Failure to observe this warning may result in injury or damage.

- Install the manipulator in a location where the manipulator’s tool or the workpiece held by the manipulator will not reach the wall, safeguarding, or NX100 when the arm is fully extended.
  
  Failure to observe this warning may result in injury or damage.

- Do not start the manipulator or even turn ON the power before it is firmly anchored.
  
  The manipulator may overturn and cause injury or damage.

**CAUTION**

- Do not install or operate a manipulator that is damaged or lacks parts.
  
  Failure to observe this caution may cause injury or damage.

- Before turning ON the power, check to be sure that the shipping bolts and brackets explained in Fig. 2 “Transport Using a Crane” are removed.
  
  Failure to observe this caution may result in damage to the driving parts.
4.4.1 Installation of Safeguarding

To insure safety, be sure to install the safeguarding. They prevent unforeseen accidents with personnel and damage to equipment. The following is quoted for your information and guidance.

**Responsibility for Safeguarding (ISO 10218)**

The user of a manipulator or robot system shall ensure that safeguarding is provided and used in accordance with Sections 6, 7, and 8 of this standard. The means and degree of safeguarding, including any redundancies, shall correspond directly to the type and level of hazard presented by the robot system consistent with the robot application. Safeguarding may include but not be limited to safeguarding devices, barriers, interlock barriers, perimeter guarding, awareness barriers, and awareness signals.

4.4.2 Mounting Procedures for Manipulator Base

The manipulator should be firmly mounted on a baseplate or foundation strong enough to support the manipulator and withstand repulsion forces during acceleration and deceleration. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion force of the manipulator. (Refer to Table 3 “Maximum Repulsion Forces of the Manipulator at Emergency Stop”.) A baseplate flatness must be kept at 0.5 mm or less: insufficient flatness of installation surface may deform the manipulator shape and affect its functional abilities. For installation, refer to "4.4.3 Mounting the Manipulator on the Baseplate”.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Maximum Repulsion Forces of the Manipulator at Emergency Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum torque in horizontal rotation (S-axis moving direction)</td>
<td>2500N•m (260kgf•m)</td>
</tr>
<tr>
<td>Maximum torque in vertical rotation (L- and U-axis moving direction)</td>
<td>3730N•m (380kgf•m)</td>
</tr>
</tbody>
</table>

4.4.3 Mounting the Manipulator on the Baseplate

The baseplate should be rugged and durable to withstand maximum repulsion force of the manipulator and to ensure that the manipulator and fixture are in the correct relative position. The thickness of the baseplate is 40 mm or more and an M16 size or larger anchor bolt is recommended.

Fix the manipulator base to the baseplate with the hexagon socket head cap screws M16 (4 screws, length of 70 mm or more is recommended) using mounting holes on the manipulator base. Tighten the hexagon socket head cap screws and anchor bolts securely so that they will not work loose during operation.
4 Transport and Installation

4.4 Installation

Fig. 4 Mounting the Manipulator on Baseplate (EPX1250-B000)
4.4.4 Location

When installing the manipulator, satisfy the following environmental conditions.
- Ambient temperature: 0°C to 40°C
- Humidity: 20 to 80%RH at constant temperature
- Free from exposure to water, oil, or dust
- Free from corrosive gas or liquid, or explosive gas or liquid
- Free from excessive vibration (Vibration acceleration: 4.9 m/s² [0.5G] or less)
- Free from large electrical noise (plasma)
- Flatness for installation is 0.5 mm or less

4.4.5 Controller and Programming Pendant

- The controller and the programming pendant are not explosion-proof (the explosion-proof programming pendant is available as an option). Never install the controller and the programming pendant that are not explosion-proof in a hazardous location.
- Keep a minimum space of 60 cm around the controller for maintenance. When the sufficient space is not available, provide equipment for maintenance such as a drawing-out system.
- An exhaust fan is provided on the back of the controller. Keep enough space behind the controller so that air can be exhausted properly.
- Do not install the controller and programming pendant close to any noise source such as the power supply for other devices.
- Install the controller in a location where the optimum atmosphere, temperature, and humidity are assured and provide protection against water drops or thinner. If necessary, install a control room to supply clean and temperature-controlled air.

4.4.6 Safety Devices

The standard safety devices are listed below. Refer to the instructions for connecting safety devices required for your system application. Install each device considering each function.
- Emergency stop switches
- Safety plugs
- Limit switches
- Flashing lights
- Indicator lamps
- Photoelectric intrusion detecting switches
5 System Configuration

5.1 Manipulator

The explosion-proof manipulator can be installed in hazardous locations such as in the painting booth. For painting, a spray gun is mounted on the end of the wrist with special fixtures.

Fig. 6 "Dimensions and P-point Maximum Envelope" shows the dimensions and the range of motion of the MOTOMAN-EPX1250. The manipulator is driven by the servo motors in vertically articulated operation mode with 6 degrees of freedom on the manipulator base. The motion of the manipulator is made by 6 axes:
The three main axes are used for positioning the spray gun: the S-axis which turns the arm, the L-axis which moves the arm left and right, and the U-axis which moves the arm up and down.
The three wrist axes are used for changing the direction of the spray gun: the R-, B-, and T-axes.
The range of motion shown in Fig. 6 "Dimensions and P-point Maximum Envelope" is that of the wrist axis center P-point that is made by the combination of the motions of the three main axes.

WARNING

When taking safety precautions, consider the range of motion of the manipulator shown in Fig. 6 "Dimensions and P-point Maximum Envelope".
5 System Configuration

5.1 Manipulator

Fig. 5 System Configuration
Fig. 6 Dimensions and P-point Maximum Envelope
5.2 Robot Controller

The robot controller has a built-in microcomputer that controls all motion of the robot by saving motion signals when teaching and sending these signals to the manipulator. The power unit that supplies power to the manipulator is also built into the robot controller.

**WARNING**

- The power supply of the robot controller is 200/220 VAC. Be sure to turn OFF the primary power supply of the controller before starting maintenance.

Failure to observe this warning may result in electric shock.

5.3 Pneumatic Unit

The pneumatic unit supplies protective air or gas to the manipulator to prevent explosive gas from entering the manipulator. Usually, the unit is attached to the inside of the robot controller. The circuit diagram and dimensions are shown in Fig. 7 "Pneumatic Unit Air Circuit". Set the air pressure so that the pressure shown on the pressure gauge of each pressure reducing valve will be within the pressure ranges shown in Fig. 7 "Pneumatic Unit Air Circuit".

**CAUTION**

The pneumatic unit is used to provide a pressurized explosion-proof barrier for the manipulator. Because the barrier is only ensured when the air supply is within the recommended pressure range, a lower air pressure will reduce the barrier’s efficiency, and a higher air pressure will damage the pneumatic unit. Be sure to keep the air pressure within the specified range.
5 System Configuration

5.3 Pneumatic Unit

Fig. 7 Pneumatic Unit Air Circuit

Fig. 8 Pneumatic Unit External View
5.4 Tubes

Daily inspection is requested for the tubes used for supplying paints, thinner, and air (not the tube for supplying protective gas into the manipulator). Replace them periodically.

5.5 O-Ring and X-Ring in the Wrist

Periodically replace the O-ring and X-ring in the wrist. Contact your Yaskawa representative to replace the ring.
6 Connection

6.1 Wiring

**WARNING**

- Ground resistance must be 100 Ω or less.
  Failure to observe this warning may result in fire or electric shock.
- Before wiring, make sure to turn the primary power supply OFF, and put up a warning sign.
  (ex. DO NOT TURN THE POWER ON.)
  Failure to observe this warning may result in fire or electric shock.

**CAUTION**

- Wiring must be performed by authorized or certified personnel.
  Failure to observe this caution may result in fire or electric shock.
- Do not cover the cable with heat insulating material, and avoid multiple cabling.
  Failure to observe this caution may result in burn caused by cable heat emission failure.
6.1.1 Grounding

Follow the local regulations for ground line size. A line of 5.5 mm² or more is recommended. Refer to Fig. 9 "Grounding Method".

**NOTE**
- Do not use this line in common with other ground lines or grounding electrodes for other electric power, motor power, welding devices, etc.
- When metal ducts, metallic conduits, or distributing racks are used for cable laying, ground in accordance with Electric Equipment Technical Standards.

The grounding methods differ depending on the system application. Refer to the connection instructions that are provided separately.

![Fig. 9 Grounding Method](image-url)
6.2 Cable Connection

Refer to the NX100 Instruction Manual for the connection of the power cable and the intrinsically safe cable to the NX100. The air hoses for the pressure switches, the intrinsically safe cable, and the crimped terminals should be prepared by the customer.

Grounding positions for power cables
For grounding, use the following parts;
- Hexagon socket head cap screw M5 (5 screws, length: 5 mm) (delivered with the base connector)
- Conical spring washer 2H-5 (delivered with the base connector)

Fig. 10 (a) Manipulator Cable Connection (to the Base Connector Side)
6 Connection
6.2 Cable Connection

Fig. 10 (b) Manipulator Cable Connection (to the Manipulator Side)
6 Connection
6.2 Cable Connection

6.2.1 Connection to the NX100

Connect the plugs of the power cables and the signal cables as indicated in the figure below.

**WARNING**

Do not open the door with power ON.

**WARNING**

Pushing the axis switches. Support the robot arms before.

Result in injury or damage to equipment.

**BRAKE RELEASE**

100 kA

kVA

NJ2533-1

MADE IN JAPAN

**TYPE**

480V

**SERIAL No.**

DATE

50/60Hz

**INTERRUPT CURRENT**

**POWER SUPPLY**

NX100/ERCR-

**3PHASE**

NJ1530

**ORDER NO.**

THE MANIPULATOR AND CONTROLLER SHOULD HAVE SAME ORDER NUMBER.
6.2.2 Manipulator Cable Installation Example

The installation example is shown below.

- **Metal Pipe Installation**

  ![Metal Pipe Installation Diagram](image)

  **Fig. 12 Metal Pipe Installation Example**

  - Install the power cables, the signal cables, and the peripheral device coupling cables as described above.
  - The metal pipe must have sufficient strength.
  - For the explosion-proof approved parts, DO NOT use sealing fitting or sealing compound other than the products described above (manufactured by Cooper Crouse-Hinds, or equivalent).
### 6.2.3 Cable and Air Tube Connection

The cables and tubes necessary for installation are shown in the table below. The user must prepare the power supply cable, the grounding cable, the cables for optional equipment, and the air tubes.

<table>
<thead>
<tr>
<th>Use</th>
<th>Connection</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power source cable</td>
<td>Power source to/from controller</td>
<td>CVV-3.5SQ-4C</td>
</tr>
<tr>
<td>Intrinsically-safe signal line cable</td>
<td>Manipulator to/from controller</td>
<td>CVV-1.25SQ-2Cx2</td>
</tr>
<tr>
<td>Cable for conveyor-speed detection device</td>
<td>To/from controller</td>
<td>CVV-SB-1.25SQ-3C</td>
</tr>
<tr>
<td>Cable for optional equipment</td>
<td>To/from controller</td>
<td>CVV-SB-1.25SQ</td>
</tr>
<tr>
<td>Air tube for pressurized explosion-proofness</td>
<td>Manipulator to/from pneumatic unit</td>
<td>φ16/11 polyurethane tube</td>
</tr>
<tr>
<td>Air tube for air supply</td>
<td>Air supply source to/from pneumatic unit</td>
<td>φ16/11 polyurethane tube</td>
</tr>
</tbody>
</table>
When the pressure switch box is displaced from the manipulator, the internal pressure error may occur while purging due to the pressure drop. To avoid this, please follow the instruction below. Also, please be noted that the maximum length of the internal pressure air hose (air exhaust side) is 3m.
6.3 Internal Connections

Fig. 14 Internal Wiring Connection
## 7 Basic Specifications

### 7.1 Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Configuration</strong></td>
<td>Vertically articulated</td>
</tr>
<tr>
<td><strong>Degree of Freedom</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>Payload</strong></td>
<td>5 kg</td>
</tr>
<tr>
<td><strong>Repetitive Positioning Accuracy</strong>(^2)</td>
<td>± 0.15 mm</td>
</tr>
<tr>
<td><strong>Motion Range</strong></td>
<td></td>
</tr>
<tr>
<td>S-axis (turning)</td>
<td>-170° − +170°</td>
</tr>
<tr>
<td>(for wall-mounted: -60° − +60°)</td>
<td></td>
</tr>
<tr>
<td>L-axis (lower arm)</td>
<td>-65° − +120°</td>
</tr>
<tr>
<td>U-axis (upper arm)</td>
<td>-165° − +205°</td>
</tr>
<tr>
<td>R-axis (wrist roll)</td>
<td>-190° − +190°</td>
</tr>
<tr>
<td>B-axis (wrist pitch/yaw)</td>
<td>-145° − +145°</td>
</tr>
<tr>
<td>T-axis (wrist twist)</td>
<td>-360° − +360°</td>
</tr>
<tr>
<td><strong>Maximum Speed</strong></td>
<td></td>
</tr>
<tr>
<td>S-axis</td>
<td>3.23 rad/s, 185° /s</td>
</tr>
<tr>
<td>L-axis</td>
<td>3.23 rad/s, 185° /s</td>
</tr>
<tr>
<td>U-axis</td>
<td>3.23 rad/s, 185° /s</td>
</tr>
<tr>
<td>R-axis</td>
<td>6.28 rad/s, 360° /s</td>
</tr>
<tr>
<td>B-axis</td>
<td>7.16 rad/s, 410° /s</td>
</tr>
<tr>
<td>T-axis</td>
<td>8.73 rad/s, 500° /s</td>
</tr>
<tr>
<td><strong>Allowable Moment</strong></td>
<td></td>
</tr>
<tr>
<td>R-axis</td>
<td>8.0 N•m (0.82 kgf•m)</td>
</tr>
<tr>
<td>B-axis</td>
<td>8.0 N•m (0.82 kgf•m)</td>
</tr>
<tr>
<td>T-axis</td>
<td>3.0 N•m (0.3 kgf•m)</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>110 kg</td>
</tr>
<tr>
<td><strong>Ambient Conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>0 to +40°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>20 to 80%RH (non-condensing)</td>
</tr>
<tr>
<td>Vibration</td>
<td>4.91 m/s² (0.5G) or less</td>
</tr>
<tr>
<td>Others</td>
<td>Free from excessive electrical noise (plasma)</td>
</tr>
<tr>
<td><strong>Power Capacity</strong></td>
<td>1.5 kVA(^3)</td>
</tr>
</tbody>
</table>

---

\(^1\) SI units are used in the table. Gravitational units are also described in parentheses.

\(^2\) Conformed to ISO9283.

\(^3\) Differs depending on the motion pattern.
7.2 Part Names and Working Axes

Fig. 15 Part Names and Working Axes
7.3 Wrist Flange

The wrist flange dimensions are shown in Fig. 16 "Wrist Flange". Fitting depth of inside fittings must be 5 mm or less.

Fig. 16  Wrist Flange
7.4 System Application

The device required for the system application can be mounted on the horizontal arm. Observe the following restrictions.

Table 5  Restriction when Mounting the Peripheral Devices

<table>
<thead>
<tr>
<th>Application</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>For A, B, C, D and E parts</td>
<td>Up to 5 kg including the wrist part</td>
</tr>
<tr>
<td>When mounting the electrical device,</td>
<td>(For instance, the total maximum load of A, B, C, D and E parts is 2 kg if the wrist tip load is 3 kg.)</td>
</tr>
<tr>
<td>use explosion-proof devices.</td>
<td></td>
</tr>
<tr>
<td>For F and G parts</td>
<td>Up to 10 kg each</td>
</tr>
</tbody>
</table>


8 Frequent Inspections

8.1 Frequent Inspections

The painting robot is a precision device using advanced technology. It is important to frequently inspect the robot and remove any dried paint. Conduct the daily and weekly inspections listed in Table 6 "Frequent Inspections" to ensure the long life of the robot and its performance. For more information about the inspection items, refer to "8.2 Daily Inspections".

Table 6 Frequent Inspections

<table>
<thead>
<tr>
<th>No.</th>
<th>Items to be Inspected</th>
<th>Inspection</th>
<th>Daily</th>
<th>Weekly</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motion</td>
<td>Smooth tuning, horizontal, and vertical motions of each arm. The robot’s standby position does not change.</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>2</td>
<td>Noise and vibration during operation</td>
<td>No abnormal noise and vibration during robot operation.</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>3</td>
<td>Tubes</td>
<td>No severe wear and tear on paint and air supply tubes.</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>4</td>
<td>Air leakage</td>
<td>No excessive air leakage from the fitting of the motor cover.</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>5</td>
<td>Dried paint</td>
<td>Remove the dried paint on the robot.</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td></td>
<td>Pneumatic Unit</td>
<td>Water drained from the air filter</td>
<td>☑️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Pressure set value</td>
<td>The pressure of the pressure reducing valve is within the specified range</td>
<td>☑️</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 8.1 Frequent Inspections

#### Safety Devices

<table>
<thead>
<tr>
<th>No.</th>
<th>Items to be Inspected</th>
<th>Inspection</th>
<th>Daily</th>
<th>Weekly</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operation of emergency stop button and safety plug.&lt;br&gt;Dried paint</td>
<td>1. The manipulator stops immediately when the emergency stop button is pressed.</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. The manipulator stops immediately when the safety plug is pulled out.</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Remove the dried paint on the emergency stop button and the safety plug.</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Operation of the photoelectric intrusion detecting switch&lt;br&gt;Dried paint</td>
<td>1. The manipulator stops when the photoelectric switch is turned OFF.</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Remove the dried paint on the light beam detector.</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Operation of limit switch.&lt;br&gt;Dried paint</td>
<td>1. Normal operation of the limit switch</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Remove the dried paint on the limit switch.</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

#### Options

<table>
<thead>
<tr>
<th>No.</th>
<th>Items to be Inspected</th>
<th>Inspection</th>
<th>Daily</th>
<th>Weekly</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operation of the gun tilt switching</td>
<td>The gun tilt changes correctly when air is supplied.</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Operation of the shear pin system</td>
<td>1. The manipulator stops immediately when the shear pin is sheared.</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. The test valve is closed and the tube is not broken.</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 6 Frequent Inspections

**CAUTION**<br>Inspect the robot while it is in its standby position and not in motion.
8.2 Daily Inspections

Inspect the robot daily to ensure its high performance and early detection of any abnormalities.

8.2.1 Manipulator

- **Visual Inspection**
  Before turning ON the manipulator, check if any abnormality is found. Remove the jacket before the inspection if it is attached.

- **Manipulator Motions and Noise/Vibration During Operation**
  Check the manipulator’s stand-by posture when turning ON the power supply with the eyemark. Also, check for abnormal noise or vibration during operation.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never enter inside the safeguarding and the manipulator’s working envelope after turning ON the power supply.</td>
</tr>
</tbody>
</table>

- **Tubes and Air Leakage**
  Check for excessive air leakage from the tubes, the couplings, and the joint fittings of the motor on each axis when the air is supplied into the manipulator to form the explosion-proof barrier.
  The actual amount of air leakage is not important if it does not lead to the internal air pressure error. However, if internal air pressure faults occur frequently, check if the pressure of the air source and the pressure setting of the pressure reducing valve are correct and if excessive air is leaking.
8 Frequent Inspections

8.2 Daily Inspections

- Dried Paint, Dust, and Dirt
  Remove any dried paint on the manipulator and other devices.
  Replace the vinyl sheet if any.
  Replace the jacket if it is dirty.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>When using a tool to remove the dried paint, be careful not to damage the manipulator.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
</table>
| Paint stuck on the manipulator rotating parts prevents them from turning normally and smoothly. Periodically remove the paint on the manipulator.  
A cloth that is soaked in paint thinner can be used for cleaning the inside of the wrist, because an anti-thinner enclosure is provided. But, be careful not to remove the original coat of paint on the manipulator. |

8.2.2 Pneumatic Unit

- Drained Water from Air Filter
  Drain the water from the air filter on the pneumatic unit.

- Pressure
  Before moving the manipulator, check if the gauges of the pressure reducing valves on the pneumatic unit show the pressure to be within the specified range.
8.2.3 Safety Devices

- Emergency Stop Button and Safety Plug
  Before operating the manipulator, check the following to make sure that the emergency stop button and the safety plug operate correctly:
  - The manipulator stops immediately when the emergency stop button is pressed.
  - The manipulator stops immediately when the safety plug is pulled out.
  Inspect the manipulator while it is in the standby posture and not in motion with the power supply turned ON. Repeated sudden stops while the manipulator is in motion will damage the braking system.
  Remove any dried paint on the emergency stop button and the safety plug.

- Photoelectric Intrusion Detecting Switch
  Make sure that the photoelectric intrusion detecting switches operate correctly.
  Remove any dried paint on the light beam receiving section on the switch.
  When the air is purging, check the air for purging.

- Limit Switch
  Make sure that the limit switches for positioning workpieces, starting the robot, and returning the robot to the home position work correctly.
  Remove any dried paint that may obstruct the robot motion.

8.2.4 Options

- Gun Tilt Switching
  Check if the gun changes its tilt smoothly when compressed air is supplied.
  If excessive shock is applied on both ends, reduce the pressure supplied to the actuator.

- Shear Pin
  Disconnect the air supply tube, and check if the shear pin breaks immediately to shut off the power supply to the manipulator.
  Also, make sure that the air tube is not bent or crushed.
9 Maintenance and Inspection

**DANGER**

- Maintenance and inspection must be performed by specified personnel.
  
  Failure to observe this caution may result in electric shock or injury.
- For disassembly or repair, contact your Yaskawa representative.
  - Do not remove the motor, and do not release the brake.
  
  Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.

**WARNING**

- Before maintenance or inspection, be sure to turn the main power supply OFF, and put up a warning sign such as "DO NOT TURN THE POWER ON".
  
  Failure to observe this warning may result in electric shock or injury.

**CAUTION**

- The battery pack must be connected before removing detection connector when maintenance and inspection.
  
  Failure to observe this caution may result in the loss of home position data.
9.1 Inspection Schedule

Conduct daily and periodic inspections to ensure the long life of the robot and its performance. Proper inspections are essential not only to assure that the mechanism will be able to function for a long period, but also to prevent malfunctions and assure safe operation. Inspection intervals are given in the levels shown in Table 7 "Inspection Schedule". Conduct periodical inspections according to the inspection schedule in "Table 7".

In "Table 7", the inspection items are classified into three types of operation: operations which can be performed by personnel authorized of the user, operations which can be performed by personnel being trained, and operations which can be performed by service company personnel. Only specified personnel are to do inspection work.

The inspection interval must be based on the servo power supply ON time.

Table 7 Inspection Schedule

<table>
<thead>
<tr>
<th>Item</th>
<th>Inspection Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S-, L-, R-, B- and U-axes motors</td>
<td>Visual</td>
<td>Check for grease leakage</td>
<td>○ ○ ○</td>
</tr>
<tr>
<td>2</td>
<td>Base mounting bolts</td>
<td>Wrench</td>
<td>Tighten loose bolts. Replace if necessary</td>
<td>○ ○ ○</td>
</tr>
<tr>
<td>3</td>
<td>Cover mounting screws</td>
<td>Wrench</td>
<td>Tighten loose bolts. Replace if necessary</td>
<td>○ ○ ○</td>
</tr>
<tr>
<td>4</td>
<td>Motor connectors</td>
<td>Manual</td>
<td>Check for loose connectors</td>
<td>○ ○ ○</td>
</tr>
<tr>
<td>5</td>
<td>Air seals for internal pressure</td>
<td>Visual</td>
<td>Check for wear or tear. Replace if necessary. See Chap. 9.2.3</td>
<td>○ ○</td>
</tr>
<tr>
<td>6</td>
<td>Wire harness in the manipulator (for S- and L- axes)</td>
<td>Visual MULTI-meter</td>
<td>Check for conduction between the main connector of the base and the intermediate connector with manually shaking the wire. Check for wear on the protective spring</td>
<td>○ ○</td>
</tr>
</tbody>
</table>

Note: The inspection interval must be based on the servo power supply ON time.
### 9. Maintenance and Inspection

#### 9.1 Inspection Schedule

When checking for conduction with multimeter, connect the battery to “BAT” and “OBT” of connectors on the motor side for each axis, and then remove connectors on detector side for each axis from the motor. Otherwise, the home position data may be lost. (Refer to "9.5.1 Encoder Connector with Warning Label").

Internal cables to be replaced at 24000 H inspection.

For the grease, refer to Table 8 "Inspection Parts and Grease Used".

Inspection No. correspond to the numbers in Fig. 18 "Inspection Parts and Inspection Numbers (EPX1250-B000)".

The occurrence of a grease leakage indicates the possibility that grease has seeped into the motor. This can cause a motor breakdown. Contact your Yaskawa representative.

### Table 9.1-1 Inspection Schedule

<table>
<thead>
<tr>
<th>Item</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Wire harness in the manipulator for B- and T-axes</td>
<td>Visual Multi-meter</td>
<td>Check the conduction between terminals. Check for wear on the protective spring.</td>
<td>○ ○</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Replace the cables</td>
<td>○</td>
</tr>
<tr>
<td>#2</td>
<td>B-, L-, and U-axes speed reducer</td>
<td>Grease gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease (^3) (6000 H cycle). (See Chap. 9.2.1.) Replace grease (^3) (12000 H cycle). (See Chap. 9.2.1.)</td>
<td>○ ○</td>
</tr>
<tr>
<td>#3</td>
<td>R-, B-, and T-axes speed reducer</td>
<td>Grease gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease (^3) (6000 H cycle). (See Chap. 9.2.1.)</td>
<td>○ ○</td>
</tr>
<tr>
<td>#4</td>
<td>Explosion-proof devices</td>
<td></td>
<td>Confirm that the pressure switches, the master valve, and the explosion-proof system operate correctly. (Replace if necessary.)</td>
<td>○ ○</td>
</tr>
<tr>
<td>#5</td>
<td>Pneumatic unit</td>
<td></td>
<td>Confirm that the solenoid valve, the pressure reducing valve and relief valve operate correctly. (Replace if necessary.) Replace the filter (6000 H cycle).</td>
<td>○ ○</td>
</tr>
<tr>
<td>#6</td>
<td>Overhaul</td>
<td></td>
<td>Contact your Yaskawa representative.</td>
<td>○</td>
</tr>
</tbody>
</table>

\(^1\) When checking for conduction with multimenter, connect the battery to “BAT” and “OBT” of connectors on the motor side for each axis, and then remove connectors on detector side for each axis from the motor. Otherwise, the home position data may be lost. (Refer to "9.5.1 Encoder Connector with Warning Label").

\(^2\) Internal cables to be replaced at 24000 H inspection.

\(^3\) For the grease, refer to Table 8 "Inspection Parts and Grease Used".

\(^4\) Inspection No. correspond to the numbers in Fig. 18 "Inspection Parts and Inspection Numbers (EPX1250-B000)".

\(^5\) The occurrence of a grease leakage indicates the possibility that grease has seeped into the motor. This can cause a motor breakdown. Contact your Yaskawa representative.
## 9 Maintenance and Inspection

### 9.1 Inspection Schedule

![Robot Parts Diagram](image)

**Fig. 18** Inspection Parts and Inspection Numbers (EPX1250-B000)

<table>
<thead>
<tr>
<th>No.</th>
<th>Grease Used</th>
<th>Inspected Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>🌅</td>
<td>VIGO grease RE No. 0</td>
<td>S-, L-, and U-axes speed reducer</td>
</tr>
<tr>
<td>🌅</td>
<td>Harmonic grease SK-1A</td>
<td>R-, B-, and T-axes speed reducer</td>
</tr>
</tbody>
</table>
9.2 Maintenance for Manipulator

9.2.1 Grease Replenishment/Replacement

Fig. 18 "Inspection Parts and Inspection Numbers (EPX1250-B000)" shows the location of the components of the manipulator. Replenish or replace the grease for the following:

1) S-, L-, and U-axis speed reducers
2) R-, B-, and T-axis speed reducers

- S-, L-, and U-Axis Speed Reducers

Grease Replenishment

1. Remove the plug on the So (Lo, Uo) exhaust port.

2. Remove the plug 1/8 on the Si (Li, Ui) grease inlet and install the grease zerk A-PT1/8. Inject grease by using a grease gun.

   ![NOTE]

   If grease is injected with the plug (So, Lo, Uo) on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug (So, Lo, Uo) before the grease injection.

3. Move S-axis (L-axis, U-axis) for a few minutes to discharge excessive grease.

4. Remove the grease zers from the Si (Li, Ui) grease inlet. Wipe the So (Lo, Uo) exhaust port and the Si (Li, Ui) grease inlet. Apply seal tape on the thread part of each plug, and reinstall the plug on the So (Lo, Uo) exhaust port and the Si (Li, Ui) grease inlet.

Grease type: VIGO grease RE No.0

<table>
<thead>
<tr>
<th>Amount of grease:</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-axis: 320 cc (280 g) (640 cc (560 g) for the 1st supply)</td>
</tr>
<tr>
<td>L-axis: 220 cc (190 g) (440 cc (380 g) for the 1st supply)</td>
</tr>
<tr>
<td>U-axis: 200 cc (175 g) (400 cc (350 g) for the 1st supply)</td>
</tr>
</tbody>
</table>
9 Maintenance and Inspection
9.2 Maintenance for Manipulator

Grease Replacement

1. Remove the plug from the So (Lo, Uo) grease exhaust port.

   **NOTE**
   If grease is injected with the plug (So, Lo, Uo) on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug (So, Lo, Uo) before the grease injection.

2. Remove the plug 3/8 from the Si (Li, Ui) grease inlet and install the grease zerk A-PT3/8. Inject grease by using a grease gun.

   Grease type: VIGO grease RE No.0
   Amount of grease:
   - S-axis: 600 cc (520 g)
   - L-axis: 400 cc (350 g)
   - U-axis: 400 cc (350 g)

3. The grease replacement is completed when new grease appears from the So (Lo, Uo) exhaust port. The new grease can be distinguished from the old grease by color.

4. Move S-axis (L-axis, U-axis) for a few minutes to discharge excessive grease.

5. Remove the grease zerk from the Si (Li, Ui) grease inlet. Wipe the So (Lo, Uo) exhaust port and the Si (Li, Ui) grease inlet. Apply sealing tape on the thread part of each plug, and reinstall the plug on the So (Lo, Uo) exhaust port and the Si (Li, Ui) grease inlet. Reinstall the cover to each axis motor side.

   **NOTE**
   If the plug (So, Lo, Uo) is installed while grease is being exhausted, grease will leak inside the motor and may cause a damage. Ensure that grease has been completely exhausted before installing the plug (So, Lo, Uo).
9.2 Maintenance for Manipulator

- **Fig. 19** S-Axis Speed Reducer
  - **So**: Grease exhaust port (S-axis head part) 
    (Hexagon socket head plug PT3/8)
  - **Si**: Grease inlet (S-axis base part) 
    (Hexagon socket head plug PT3/8)

- **Fig. 20** L-Axis Speed Reducer
  - **Lo**: Grease exhaust port (L-arm part) 
    (Hexagon socket head plug PT3/8)
  - **Li**: Grease inlet (L-arm part) 
    (Hexagon socket head plug PT3/8)
9 Maintenance and Inspection
9.2 Maintenance for Manipulator

Fig. 21 U-Axis Speed Reducer
**R-, B-, and T-Axis Speed Reducers**

**Grease Replenishment**

1. Remove the plug from the Ro (Bo, To) exhaust port.

   **NOTE**
   If grease is injected with the plug (Ro, Bo, To) on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug (Ro, Bo, To) before the grease injection.
   
   Note that grease replacement is not necessary for R-, B-, and T-axes.

2. Remove the plug from the Ri (Bi, Ti) grease inlet, and install the grease zerk A-MT6. Inject grease by using a grease gun.

   **Grease type:** Harmonic Grease SK-1A
   
   **Amount of grease:**
   - R-axis: 7 cc (10 g) (14 cc (20 g) for the 1st supply)
   - B-, T-axes: 5 cc (7 g) (10 cc (14 g) for the 1st supply)

3. Move R-axis (B-axis, T-axis) for a few minutes to discharge excessive grease.

4. Remove the grease zerk on the Ri (Bi, Ti) grease inlet. Wipe the Ro (Bo, To) exhaust port and the Ri (Bi, Ti) grease inlet. Apply seal tape on the thread part of each plug, and reinstall the plug on the Ro (Bo, To) exhaust port and the Ri (Bi, Ti) grease inlet.

5. Install the cover and tighten each screw with the specified tightening torque.

---

**Fig. 22** R-, B-, and T-axes Speed Reducer
9.2.2 Inspection of Wrist Gear and Bearing

Check if three wrist axes move smoothly. If any of the axes does not move smoothly, the wrist should be removed and disassembled for investigation of the cause such as detective bearing, gear or sealing. Contact your Yaskawa representative.

![CAUTION]

To remove the wrist from the U-arm, firmly hold the wrist and remove the fixing bolt. If not, the wrist may fall down when the fixing bolt is removed.

9.2.3 Inspection of Air Sealing for Internal Air Pressure

Gasket

a) S-, L-, and U-Axes and L- and U-Arms

Check the gasket. When checking the gasket, remove the mounting bolts and the cover. Excessive oil contained in the air used to keep the internal pressure can damage the gasket, which result in air leakage. Replace the gasket if air leakage is found.

Fig. 23 Gasket for S-Axis Part
9.2 Maintenance for Manipulator

**Fig. 24** Gasket for L-Axis and L-Arm Part

- Hexagon socket head cap screw M6 (6 screws) (length: 30mm)
- Conical spring washer 2H-6
  Tightening torque 10 N•m (1.0 kgf•m)

**Fig. 25** Gasket for U-Axis Part

- Hexagon socket head cap screw M6 (6 screws) (length: 30mm)
- Conical spring washer 2H-6
  Tightening torque 10 N•m (1.0 kgf•m)
9 Maintenance and Inspection
9.2 Maintenance for Manipulator

b) Base Part
Check the damage of the gasket after removing the back cover on the base part.

Fig. 26 Gasket for U-Arm Part

Fig. 27 Gasket Check on the Base Part
9.3 Inspection of the Pneumatic Unit

9.3.1 Solenoid Valve

Check if the air purge starts a few seconds after turning ON the power to the NX100 and if it ends approximately 3 minutes later.

9.3.2 Pressure Reducing Valve

Measure the air pressure for the pneumatic unit with a pressure gauge. Remove the test plug or the relief valve on the pneumatic unit and connect the gauge. The air pressure must always be from 0.01 MPa to 0.03 MPa under normal conditions, from 0.15 MPa to 0.35 MPa when purging, and from 0.35 MPa to 0.65 MPa for the air-purge valve.
9.4 Inspection of Explosion-proof Devices

9.4.1 Pressure Switch

Remove the front cover of the pneumatic unit box and check the conduction of the pressure switches. The two pressure switches must be ON when the air is being supplied and OFF when the air is not being supplied.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Be sure to turn OFF the power to the NX100 before inspecting the pressure switch.</td>
</tr>
<tr>
<td>• Do not touch the pressure setting dial on the pressure switch during an inspection.</td>
</tr>
<tr>
<td>Changing the setting prevents the correct pressure from being detected.</td>
</tr>
</tbody>
</table>

9.4.2 Master Valve

While the air is being supplied from the pneumatic unit, check if the air purge starts a few seconds after the power to the NX100 is turned ON. Also, check if the air goes out of the two air outlets for the master valve during the air purge.

9.4.3 Pressurized Anti-Explosion Barrier

While the air is being supplied from the pneumatic unit, check if the air purge starts a few seconds after the power to the NX100 is turned ON and if it ends approximately 3 minutes later. Also, check the following:

(a) The alarm "AIR PRESSURE ERROR" occurs immediately after the air supply from the pneumatic unit is stopped and the NX100 is turned ON.

(b) The alarm "AIR PRESSURE ERROR" occurs when the air supply from the pneumatic unit is stopped during air purging.
9.5 Notes for Maintenance

9.5.1 Encoder Connector with Warning Label

Remove the old battery after connecting the new one so that the encoder absolute data does not disappear.

- **S- and L-Axis Motors**
  
  The connectors for the battery are prepared on each of the S-, L-, and U-axis motors. Refer to Fig. 28 "Backup Battery Connection for S- and L-Axis Motors", and connect the battery according to the following procedure.

  1. Remove the mounting bolts, then remove the cap on the slot of the motor’s encoder.
  2. Connect the battery (JARCR-XIS01) to the connectors for battery backup (crimped contact-pin terminals) on the inside of the cap.
  3. Confirm all connectors connection after the maintenance check ends, and remove the battery.

- **U-, R-, B-, and T-Axis Motors**
  
  The connectors for the battery backup (crimped contact-pin terminals) are prepared on the cables from the encoder connector of each of the R-, B-, and T-axis motors (BAT and OBT are marked). Refer to Fig. 29 "Backup Battery Connection for U-, R-, B-, and T-Axis Motors", and connect the battery according to the following procedure.

  1. Connect the battery (JARCR-XIS01) to the connectors for the battery backup of the motor encoder connector.
  2. Confirm all connectors connection after the maintenance check ends, and remove the battery.

**NOTE**

Do not remove the battery pack in the connector base.
9 Maintenance and Inspection
9.5 Notes for Maintenance

Fig. 28 Backup Battery Connection for S- and L-Axis Motors

Connect battery to encoder to save the data before removing connector.

CAUTION

Motor for S- and L-Axes

Encoder connector

Power connector

Encoder

Connector for the backup battery

Cover mounting screw

a: Crimped contact-pin (pin)
b: Crimped contact-pin (socket)

Battery pack

Fig. 29 Backup Battery Connection for U-, R-, B-, and T-Axis Motors

Connect battery to encoder to save the data before removing connector.

CAUTION

Motor cable, etc.

Encoder

Motor

Internal cables

Power connector

Motor cable, etc.

Encoder connector

a: Crimped contact-pin (pin)
b: Crimped contact-pin (socket)

Battery pack

Fig. 28 Backup Battery Connection for S- and L-Axis Motors

U-, R-, B-, and T-axes

Connect battery to encoder to save the data before removing connector.

CAUTION
Connect battery to encoder to save the data before removing connector.

Fig. 30 Connection Diagram

Fig. 31 Caution Label
It is recommended that the following parts and components be kept in stock as spare parts for the MOTOMAN-EPX1250. The spare parts list for the MOTOMAN-EPX1250 is shown below. Product performance cannot be guaranteed when using spare parts from any company other than Yaskawa. The spare parts are ranked as follows:

- Rank A: Expendable and frequently replaced parts
- Rank B: Parts for which replacement may be necessary as a result of frequent operation
- Rank C: Drive units

To replace parts in Rank B or Rank C, contact your Yaskawa representative.

Table 9  Spare Parts for the MOTOMAN-EPX1250-B000

<table>
<thead>
<tr>
<th>Rank</th>
<th>Part No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty. per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1</td>
<td>Sealing compound</td>
<td>DB-1600</td>
<td>Diabond Industries Co., Ltd.</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>A 2</td>
<td>Sealing tape</td>
<td>TB-4501</td>
<td>ThreeBond Co., Ltd.</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>A 3</td>
<td>Liquid gasket</td>
<td>ThreeBond 1206C</td>
<td>ThreeBond Co., Ltd.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 4</td>
<td>Liquid gasket</td>
<td>Loctite 515</td>
<td>Henkel Japan Ltd.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 5</td>
<td>Grease</td>
<td>VIGO grease</td>
<td>Yaskawa Electric Corporation</td>
<td>16 kg</td>
<td>-</td>
<td>For S-, L- and U-axes speed reducers</td>
</tr>
<tr>
<td>A 6</td>
<td>Grease</td>
<td>Harmonic Grease</td>
<td>Harmonic Drive Systems Inc.</td>
<td>2.5 kg</td>
<td>-</td>
<td>For R-, B- and T-axes speed reducers</td>
</tr>
<tr>
<td>A 7</td>
<td>Timing belt for R-axis</td>
<td>0605SM249</td>
<td>Mitsubishi Belting Ltd.</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A 8</td>
<td>Timing belt for B-axis</td>
<td>0605SM399</td>
<td>Mitsubishi Belting Ltd.</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A 9</td>
<td>Timing belt for T-axis</td>
<td>0605SM658</td>
<td>Mitsubishi Belting Ltd.</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>B 10</td>
<td>Speed reducers for S- and L-axes</td>
<td>HW1380153-A</td>
<td>Yaskawa Electric Corporation</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B 11</td>
<td>Speed reducer for U-axis</td>
<td>HW0387811-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>B 12</td>
<td>Speed reducer for R-axis</td>
<td>HW0388708-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

NOTE To replace parts in Rank B or Rank C, contact your Yaskawa representative.
## Table 9  Spare Parts for the MOTOMAN-EPX1250-B000

<table>
<thead>
<tr>
<th>Rank</th>
<th>Part No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty. per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B 13</td>
<td></td>
<td>Speed reducer for B-axis</td>
<td>HW0388709-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C 14</td>
<td></td>
<td>Speed reducer for T-axis</td>
<td>HW0388710-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C 15</td>
<td></td>
<td>Wire harness in manipulator</td>
<td>HW1170995-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C 16</td>
<td></td>
<td>Wire harness in manipulator</td>
<td>HW1370165-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C 17</td>
<td></td>
<td>AC servomotors for S-and L-axes</td>
<td>SGMRS-06A2B-YRA1</td>
<td>Yaskawa Electric Corporation</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>C 18</td>
<td></td>
<td>AC servomotors for U-axis</td>
<td>SGMFH-04A2A-YRS2</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C 19</td>
<td></td>
<td>AC servomotors for R-, B-and T-axes</td>
<td>SGMFH-01A2A-YR21</td>
<td>Yaskawa Electric Corporation</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>C 20</td>
<td></td>
<td>Pressure switch unit</td>
<td>HW1370892-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
MOTOMAN-EPX1250
INSTRUCTIONS

Specifications are subject to change without notice
for ongoing product modifications and improvements.